MASS-TRANSFER MACHINE

FIELD OF THE INVENTION

[0001] The present invention relates to an apparatus for mass-transfer. More particularly this invention concerns a mass-transfer machine.

BACKGROUND OF THE INVENTION

[0002] In an apparatus for mass transfer between a liquid and a gas inside a rotor, liquid is supplied to the center of the rotor and is driven outward by the centrifugal force generated by rotation of the rotor and gas surrounding the rotor is forced inward through the rotor by the gas pressure, counter to the liquid flow in the rotor.

[0003] WO 2015/101826 (U.S. Pat. No. 9,987,589) and WO 2016/038480 (US 2017/0028311) disclose mass-transfer machines having a rotor that has two lateral faces, a packing that drives centrally delivered liquid outward as the rotor rotates in the space between the two faces. Here the rotor is surrounded by a gas that due to the gas pressure flows through the rotor counter to the liquid, in order to produce a mass transfer between the liquid and the gas.

OBJECTS OF THE INVENTION

[0004] It is therefore an object of the present invention to provide an improved mass-transfer machine.

[0005] Another object is the provision of such an improved mass-transfer machine that overcomes the above-given disadvantages, in particular in which the mass transfer and the transport of material are substantially improved and that is easy to manufacture and assemble.

SUMMARY OF THE INVENTION

[0006] In an apparatus for mass transfer between a liquid and a gas inside a rotor, where

[0007] the liquid is supplied to a center of the rotor and is driven outward by centrifugal force generated by rotation of the rotor,

[0008] the gas surrounding the rotor is forced inward through the rotor by a pressure of the gas, counter to the liquid flow in the rotor, and

[0009] the rotor has a plurality of passages lying in the plane of the rotor that begin at a center of the rotor and terminate at an outer circumference of the rotor, the improvement wherein the passages are each filled with a packing that increases the area of contact between the liquid and the gas.

[0010] In other words, according to the invention this object is achieved in that the rotor comprises a plurality of passages lying in the plane of the rotor and that begin in the center of the rotor and terminate at the outer circumference of the rotor, the passages each being filled with a packing that increases the area of contact between the liquid and the gas.

[0011] Dividing the rotor packing into individual packing areas inside radial or angled passages inside the rotor allows an especially precise and effective mass transfer in a rotor that is easy to manufacture and assemble.

[0012] It is particularly advantageous for this purpose if the packings enclosed in the passages, particularly tubular passages, are of a woven, knitted, meshed or latticed form. Here the packings, in particular smooth or structured packings, enclosed in the passages, in particular tubular passages, are composed of metal, in particular formed from structured sheet metal, or of plastic or glass fibers.

[0013] It is proposed that preferably the inner ends of the passages or tubes form an inner coaxial space into which the liquid is delivered. It is advantageous here if the tubes or their passages are arranged in the rotor, particularly in the center of the rotor, in such a way that the liquid flowing through the rotor flows only through the passages.

[0014] It is also advantageous if the outer ends of the passages or tubes terminate in the outer cylindrical annular face of the rotor. The rotor preferably comprises one to thirty-two, preferably four to eight passages, in particular tubes.

[0015] In a simple rotor design that is easy to produce the rotor comprises two circular lateral disks or faces to which the axis of rotation of the rotor runs perpendicular and that form a space between them in which the passages, in particular tubes, are arranged. The tubes/the passages may also extend outward continuously or in steps. The tubes/passages may furthermore be assembled from individual, separate portions.

BRIEF DESCRIPTION OF THE DRAWING

[0016] The above and other objects, features, and advantages will become more readily apparent from the following description, reference being made to the accompanying drawing in which:

[0017] FIG. **1** is a perspective view of the rotor of this invention with two parallel disks; and

[0018] FIG. **2** is another perspective view of the rotor, but with one of the disks removed for clarity of view.

SPECIFIC DESCRIPTION OF THE INVENTION

[0019] As seen in the drawing, the mass-transfer machine according to the invention has a rotor **1** that as shown in according to FIG. **1** has two circular lateral faces or disks **2** and **3** of the same diameter and both coaxial and parallel with one another that between them form a narrow space **4** of constant width. Both faces/disks **2**, **3** are fixed on and extend perpendicularly from an unillustrated central shaft and each have a central aperture **5**.

[0020] Multiple tubes **6** that form passages **7** extend radially in the space **4** between the two faces/disks **2**, **3**. The radial tubes begin with their inner end at the edge of the aperture **5** and terminate with their outer end in the outer coaxial, cylindrical annular outer edge **8** of the rotor **1**. At the apertures **5** the inner ends of the tubes/passages form an inner coaxial inner space **9** into which a liquid is delivered. The outer ends of the tubes **6** terminate in the outer cylindrical annular surface **8** of the rotor. This ensures that the tubes **6** or their passages **7** are arranged in the rotor **1**, particularly in the center of the rotor, in such a way that the liquid flowing through the rotor flows only through the passages **7**.

[0021] All tubes **6** are filled with a packing (not shown), the function of which is to increase the area of contact between the liquid supplied to the inner space **9** and the externally acting gas, in particular so as to optimize mass transfer. The packings enclosed in the passages **7**, particularly tubular passages, are preferably of a woven, knitted, meshed or latticed form. Here the packings enclosed in the in particular tubular passages **7** are composed of metal, in particular structured sheet metal, or of plastic or glass fibers.